ON THE

2

SUCCESSFUL TREATMENT OF CASES

OF

CONGENITAL DISPLACEMENT

OF

THE HIP-JOINT

By Complete Recumbency with Extension for Two Years.

BY

WILLIAM ADAMS, F.R.C.S.,

Surgeon to the Great Northern Central Hospital, and to the National Hospital for the Paralysed and Epileptic; Consulting Surgeon to the National Orthopædic Hospital; late President of the Medical Society of London, etc.

Reprinted for the Author from the BRITISH MEDICAL JOURNAL. Feb. 22, 1890.

PRINTED AT THE OFFICE OF

THE BRITISH MEDICAL ASSOCIATION, 429, STRAND, W.C.



ON THE SUCCESSFUL TREATMENT OF CASES OF CONGENITAL DISPLACEMENT OF THE HIP-JOINT BY COMPLETE RECUMBENCY WITH EXTENSION FOR TWO YEARS.[1]

At the meeting of our Association held at Brighton in August, 1886, I read a paper in the Surgical Section on The Treatment of Congenital Displacement of the Hip-joint by long-continued Recumbency and Extension.[2] In that paper, after passing in review the chief points in the pathology and clinical history of this affection which are now well established, I brought prominently before the members the treatment adopted by one of the leading American surgeons, Dr. Buckminster Brown, of Boston, who had carried out the recumbency and extension treatment more thoroughly and for a longer period than had hitherto been done. Dr. Brown had in 1885[3] published the account of a very successful case, with photographs taken two years and three months after the commencement of treatment, which had been continued strictly for thirteen months. The child then began to walk in a go-cart for five months longer. To all appearance in this case, one of double displacement in a girl aged 4 years, there was a complete restoration of the natural form of the hips, and the lordosis was also completely removed. The walk was said to be natural, and the patient's health not in any way injured.

This success encouraged me to give the treatment a fairer trial than I had hitherto done. At the time of reading the paper I had commenced the treatment in two cases, and since then have applied the same method to four other cases. Two of the six cases were double, that is, both hip-joints affected, and four single; in three of the latter the right hip-joint was affected, and in one the left hip-joint. In two of the cases, both examples of single displacement occurring in girls of about 2 years of age at the commencement of treatment, recumbency with extension has been carried out to the full period of two years in one, and two years and seven months in the other case; and they have been now some months walking about with a steel support on the affected limb.

At the present time I am enabled to report that the result of this treatment appears to be extremely satisfactory, and equally so in both cases. When these children are examined undressed on

[1] Read in the Section of Surgery at the Annual Meeting of the British Medical Association held at Leeds.

[2] JOURNAL, April 23rd, 1887.

[3] "Double Congenital Displacement of the Hip." By Buckminster Brown, M.D. Boston: Cupples, Upman and Co. 1885.

the table there is no apparent inequality in the length of the legs. Sometimes, by careful measurement, the affected limb seems to be an eighth, or from that to a quarter, of an inch shorter than the other, but we cannot always make as much. The ilio-femoral triangle of the affected limb corresponds pretty closely with that on the healthy side, so that the head of the femur is now retained very nearly in its natural situation, and there is no disposition to any spontaneous alteration. Nor is there any tendency to displacement upwards when gentle manipulation is tried by fixing the pelvis, and testing by a little movement directed upwards from the thigh. Of course this has only been tried gently, but the head of the femur seems to be fairly maintained in its improved position; and the contrast, as compared with the condition of parts before the commencement of treatment, is very great. All the movements of the joints are free, and the muscular nutrition has been well maintained.

The general health has not been in the least interfered with, and, indeed, in both instances the parents consider that the children have improved in health. During the whole period of recumbency these children have been drawn out in a spinal carriage in the open air, lying down on the movable plane forming part of the extension couch, the extension acting all the time. This extension couch I have also used with great advantage in two cases of hip-joint disease.

At the present time we can only hope that the improvement gained by the treatment will be permanently maintained, but at least another six months or a year will be required to test this, after the children have left off the steel supports they are now wearing. I will give a further report at the end of that time. The details of these cases are given below:

Objects of Treatment, and Details of the Method Adopted.

In reference to the pathological conditions which have now been shown to exist in these cases, the object of any method of treatment adopted must be, when the case is undertaken at a sufficiently early period—say 2 years of age or less—to prevent the gradual displacement of the head of the femur by the elongation of the capsular ligament, which takes place when the child begins to walk and throws the weight of the body upon the limb, or limbs, in which the congenital malformation of the hip-joint with imperfect development of the acetabulum exists.

This can only be accomplished by long-continued recumbency with extension, so adapted that the head of the femur is retained as nearly as possible in its natural position during a long period of active growth, say, from a year and a half to two years' duration. For this purpose I use the new extension couch, constructed for me by Mr. Ernst, and described in my paper at the Surgical Section of our Association at Brighton, in August, 1886, when it was exhibited at the meeting. Drawings of this couch, given me by Mr. Ernst, are now shown to the meeting.

At the end of this period the child should be gradually allowed to walk with a steel support, when one hip-joint only is affected, somewhat resembling the American hip-joint instrument, which allows of motion at the hip-joint and still maintains extension, whilst the weight of the body is removed from the affected limb. In Sayre's hip-joint splint the weight of the body is sustained by the perineal straps attached to the pelvic band, but in the apparatus Mr. Ernst has constructed for me not only are the perineal

bands used, but the tuberosity of the ischium is made to rest upon the back part of the metal thigh trough, so that every care is taken to prevent the weight of the body being thrown upon the affected limb. A raised boot, one inch and a half in thickness, is worn on the healthy limb, and an iron ring-patten on the affected limb. To this ring-patten the boot is fastened by short straps, and the extension is made by a rack-and-pinion movement in the lever on the leg. As a part of this walking splint I have combined the use of the pelvic belt suggested by Dr. B. Brown, with a large pad placed just above the great trochanter to assist in preventing the head of the femur slipping upwards. With this apparatus the child may be allowed to walk for six months or a year, when it may be gradually discontinued, the child at first using crutches and then one or two sticks. Altogether extension is maintained for a period of two to three years—I prefer the longer period—and the head of the femur kept as nearly as possible in its natural position during the whole time.

When both hip-joints are affected the best form of apparatus to be used at the commencement of the walking period, that is, in the second stage of the treatment, is that employed by Dr. B. Brown, a kind of square go-cart upon four wheels, with a leather strap passing from before backwards, and buckled upon the cross bars. On the centre of the strap is a small saddle, on which the child sits at such a height as to allow only the toes to touch the floor. There are crutches also attached to the sides of the go-cart to assist in sustaining the weight of the body, and a webbing belt passes round the body.

It will thus be evident that the treatment is divided into two stages.

The principle of the first stage is that of complete recumbency, with slight extension, and immobility as complete as can be sustained with comfort, continued night and day for a period of eighteen months to two years. I advise two years if the health is well maintained—and it has been well maintained in the cases under treatment. If the case is undertaken at a sufficiently early period, say, at two years of age or less, the treatment in this stage is essentially preventive.

The principle of the second stage is that of extension, with mobility maintained during progression, without the weight of the body being thrown upon the affected limb or limbs. This can be accomplished in cases of single displacement by an apparatus very much resembling the well known American hip-joint instrument, and in cases of double displacement by the go-cart and saddle used by Dr. B. Brown. This apparatus should be used for a period of six months to a year—I advise a year. Crutches may be used at first.

The transition from the first to the second stage should be made very gradually, the child at first being allowed to walk with the instrument two or three times a day for a quarter to half an hour, and then return to the extension couch, which is also to be used at night during the whole treatment, and possibly afterwards. During the whole of this stage, and for some time before it is commenced, massage to the affected limb or limbs should be practised twice daily for half an hour each time. It should be applied more especially to the neighbourhood of the hip-joint and the glutei muscles, but it should also be used to strengthen the muscles of the thigh and leg in the affected limb or limbs.

At the end of the second stage, the patient begins to walk in the ordinary way, without any instrumental assistance, but at the

commencement crutches should be used, or the nurse should give the child assistance by holding it under the arms, so as to prevent the whole weight of the body being thrown upon the affected limb or

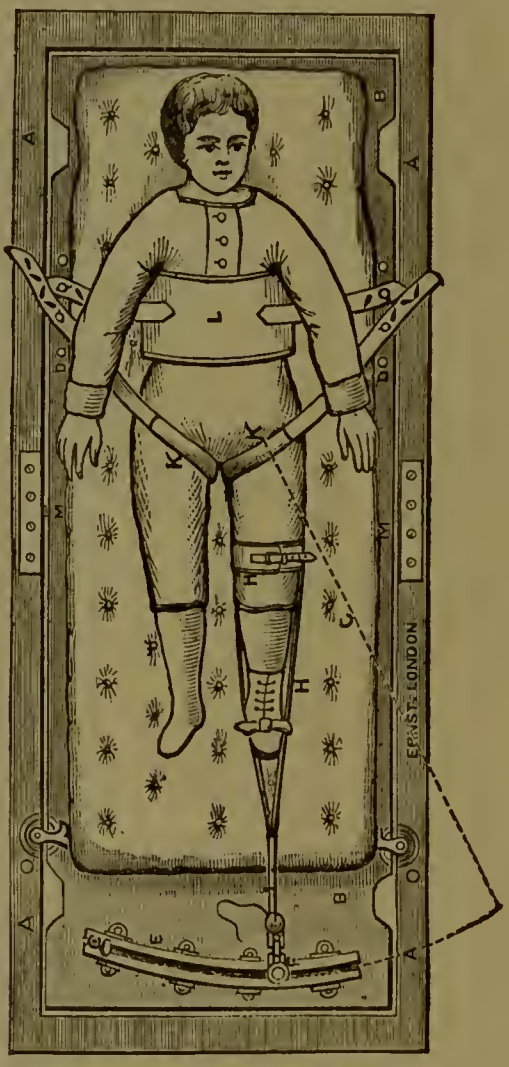


Fig. 1 represents the plan of the extension mechanism. The counter-extension is taken from the perineum by two perineal straps K K made of india-rubber tubing; these are cleaner and more adjustable than the padded form. A chest band L is attached to keep the child from moving. Both the chest band and perineal straps are attached to studs D D on each side of the couch. The extension is made by the thigh bandage H and gaiter H. This is connected by a cord to the standard F, which has fixed at the upper part a check attachment known as Durham's pulley. The salient point here is the quadrant movement E. The standard F is fastened at its lower part to a flat sliding piece, which moves in the quadrant up to the distance of the thumb-screw G; by this means it is possible to bring the standard to the extreme point in the dotted line, giving the full abduction of the limb if requisite. As this quadrant is an arc with the radius emanating from the hip-joint it is apparent that in abducting the limb no loss or increase in the extension power takes place. The thumb-screw G is fixed at whatever position it is desirable to keep the standard.

limbs. The transition from the second stage to walking without any mechanical assistance must also be made very gradually.

When the case is undertaken at a later period, say about 5

years of age, or even up to 8 or 10, when the displacement has become more confirmed, the same treatment may be carried out,

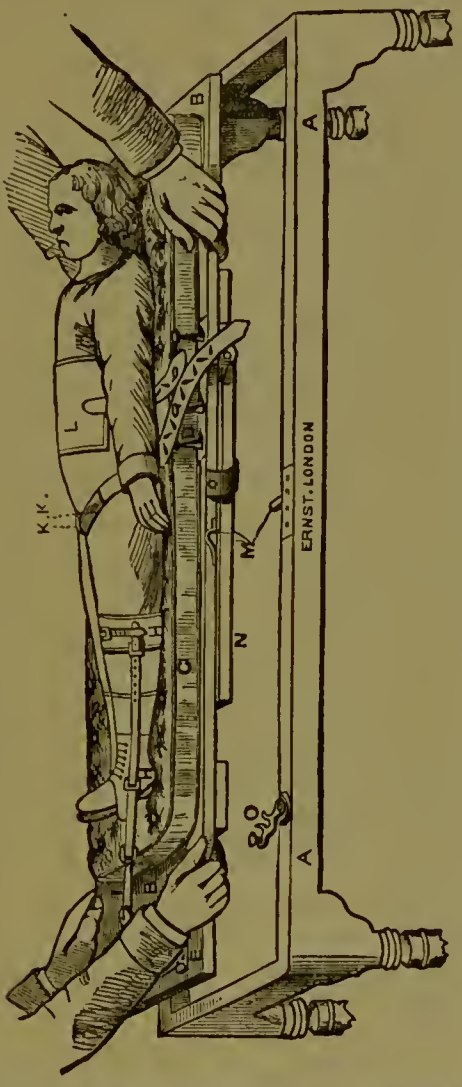


Fig. 2, showing the method of detachment, will be clearly understood. The gun metal arches M are regulated so as to permit the tilting and easy removal; their shape explains the plan. It is now only necessary to fasten the "sliding guides" up to the couch by leather straps, and the board is complete for outdoor transport. In the cases under treatment the patients live in this position. The couch is fitted with a horsehair mattress, and at night a blanket and sheet are carefully placed between the child and the mattress; this can be best accomplished by one person holding the child under the axillæ, and extending gently whilst the perineal and chest straps are unfastened and the "bed" made. In washing it is necessary to place a mackintosh cloth over the entire mattress. The treatment principally depends on rest and the maintenance of the limb in an extended position. This is easily accomplished, for there is no existing contraction, and it is only when the patient stands that the elongated capsular ligament permits the rising of the limb and consequent shortening; the extension force is therefore very slight, and only sufficient to keep the limb in unison with the other.

in the hope that the upper and unused portion of the dilated capsule will spontaneously contract during growth. In uni-

lateral displacement, the pelvic tilting and deformity, as well as the lateral curvature of the spine, will certainly be diminished to the lowest possible point by recumbency with extension during active growth, and in a case of double displacement, the pelvic deformity and lordosis will certainly be diminished.

At a still later period, that is, after 10 years of age, there cannot be any reasonable hope of much improvement so far as the articulation is concerned, except in favourable cases, by the subcutaneous operation which I have proposed, in the hope of obliterating the upper part of the cavity formed by the elongated capsular ligament. By this means, together with partial recumbency and extension, the consecutive deformities may be diminished during the period of growth, say up to 17 or 18 years of age.

In cases of unilateral displacement, weight extension at night and recumbency, or partial recumbency, for four or six hours a day in a spinal chair will be useful up to 17 or 18 years of age; and, as a gymnastic exercise, I recommend the use of the trapeze bar three times a day, the patient wearing a leaden clog, weighing four pounds, on the foot of the affected limb during the exercise. By this means the muscles surrounding the hip-joint are brought into play, whilst the head of the femur is drawn down towards its natural position by the leaden clog, acting as an extension weight, attached to the foot. When all hope even of diminishing the consecutive deformities is given up, it is still desirable that the patient should avoid long standing, and all walking exercises should be limited to one hour, and then followed by recumbency for one hour; exercise for short periods alternating with rest.

Permanency of the Improvement.

With regard to the permanency of any improvement gained by long-continued recumbency with extension we must expect the profession to remain sceptical until sufficient time has elapsed after the discontinuance of all treatment; and also until it has been tried in a sufficient number of cases. I have frequently been asked: What is to keep the head of the femur in or near to its normal position when there is no acetabulum?

I believe the answer will be found in the adapted growth of the capsular ligament and all the surrounding muscles and fibrous structures, gradually occurring in the period of two or three years, during which the head of the femur is retained as nearly as possible in its natural position.

We know that the displacement of the head of the femur upwards, or in whatever direction it may be, is limited by the surrounding muscular and fibrous structures, and that a resting place is found, not by any new bone thrown out or any attempt at the formation of a new acetabulum, which would be prevented by the capsular ligament intervening between the head of the femur and the surface of the ilium, as the head of the bone never leaves the capsular ligament; but, still, a circular-flattened depression is gradually made on the surface of the ilium by the pressure of the head of the bone. This may be seen in all the specimens, except the one in St. Thomas's Museum, in which a little periosteal bone had been thrown out where the head of the femur had rested. We may therefore reasonably hope that a similar depression will be made in or near to the natural situation of the acetabulum by the treatment adopted, and this, together with the adapted growth of the capsular ligament and the surrounding muscular and fibrous structures, will assist in maintaining the head of the femur in the improved position in which it has been

maintained for two or three years. The unused upper portion of the capsule, we may also hope, will gradually contract.

Some support of these views may be derived from the following observation: When the limit of displacement has been reached the head of the femur becomes much more fixed in some cases than in others, that is, it cannot be moved downwards by extension except to a very limited extent; and the lower and unused half of the capsular ligament appears to undergo a process of contraction, so that it would be incapable of receiving the head of the bone. The sides of this portion of the cavity may become flattened and compressed, or approximated, and, without anything approaching to obliteration, the cavity may be intersected by some bands of adhesion.

The only specimen in London, so far as I know, in which these pathological changes can be demonstrated is the one in St. Thomas's Hospital Museum, Nos. 42 and 43, Section D. This specimen is figured in the *Trans. Path. Soc.*, vol. xxxviii, 1887, Plates XII and XIII. The case was evidently one of congenital displacement of both hip-joints in a girl aged 16—a dissecting room specimen, without any history, but it is mentioned that both thighs were flexed and contracted at the hip-joints, so that movement had become restricted. One innominate bone, with the upper portion of the femur, has been completely macerated and put up dry to show the osseous changes, No. 42, and the other innominate bone, with the upper portion of the femur, has been partly macerated, with the capsular ligament dissected and remaining intact and put up as a wet preparation, No. 43. In the dry preparation, on the dorsum ilii, near to the upper margin of the sciatic notch, is a flattened, circular, medallion-like surface, slightly raised, upon which the head of the femur had undoubtedly rested for a considerable time, in consequence of impaired mobility from some muscular contraction. In the wet preparation the capsular ligament is seen to be greatly elongated, extending from the upper border of the obturator foramen below to cover the head of the femur above in its displaced position on the dorsum ilii; it is also greatly increased in thickness and density. Mr. Shattock was kind enough, at my suggestion, to lay open the capsular ligament in front in its entire length. This exposed the head of the femur, still within the capsular ligament, at its upper part. In its lower half the thickened capsular ligament was depressed or flattened so as to diminish the cavity, which apparently would not have been capable of receiving the head of the femur, had any attempt been made by extension to draw it towards its natural position. The inner surfaces of the thickened capsular ligament, although approximated, were not at any part adherent, but some slender bands of adhesion passed between these surfaces, intersecting the cavity

This is the nearest approach to what I think may take place in the upper half of the capsular ligament when the head of the femur has been held down by extension for a sufficiently long period; or what might be accomplished by the operation I have suggested, of transfixing the upper half of the cavity by a double ligature, and then carrying one of the threads subcutaneously round each segment so as to emerge at the aperture of entrance. Then each segment could be tied separately, in the hope of occluding more or less completely the upper portion of the cavity. Should more than slight irritation follow the threads could be cut and removed, and if necessary from excessive effusion with tension the cavity might be punctured with a small trocar. I have not yet had the opportunity of performing this operation.

For a practical demonstration as to the permanency of the improvement obtained by the long-continued recumbency with extension, carried out by the method I have adopted, sufficient time has not yet elapsed in my two earliest cases now reported, although the prospect at the present time is extremely favourable.

In Dr. Buckminster Brown's case, the child was allowed to walk without any support eighteen months after the commencement of treatment; and at the end of two years and three months, when the published photographs were taken in March, 1885, the improvement gained by treatment had been fully maintained. The result had the appearance of being perfect, and with every prospect of being permanent.

Dr. B. Brown, when residing in Paris during the years 1845 and 1846, had the advantage of seeing three or four of these cases treated by the late M. Jules Guérin, who practised subcutaneous division of the muscles, followed by extension, with partial though not complete success, according to the report of the Commission ssued in 1848.[4] Dr. Brown did not, therefore, adopt the operation, but relied upon recumbency, with extension.

The late Dr. Carnochan,[5] who first directed my attention to this subject in the year 1844, at St. Thomas's Hospital, also gained his early knowledge of the affection from the study of Dupuytren's unique collection of specimens in Paris, and the observation of the practice of Guérin and other surgeons. He gives full credit to the successful result of treatment in some cases of M. Pravaz,[6] of Lyons, which was confirmed by a report of the Commission of the Royal Academy of Paris, appointed to examine these cases in the year 1838. In this report, one case is stated to have remained cured two years after the reduction.

The best result of the treatment by recumbency with extension which I have seen, though not carried out to the full extent or in the manner I have recommended, was in the case of a young gentleman, aged 19, who had been treated in this way, when about 6 years of age, for displacement of the left hip-joint, considered by the surgeon who attended the case to be the result of infantile paralysis, for which the same surgeon had previously treated him.

I first saw the case on December 6th, 1872, and pronounced it to be one of congenital displacement of the hip, an opinion in which Mr. (now Sir) Prescott Hewett entirely agreed with me. Not a trace of paralysis existed, nor was there any history of hip-joint disease. The child had limped from the time it began to walk. Recumbency, with a long straight splint and weight extension, had been carried out for fifteen months, and then very little walking was allowed, with steel supports, a pelvic belt, and crutches for seven months. When last seen by me (May 21st, 1883), the patient being then 19 years of age, there was only one inch and a quarter shortening, and, with a boot raised one inch and a quarter, the limp in walking was very slight; the leg was strong and all the joint movements free. He said he was able to take any amount of exercise. Only a slight spinal curvature existed in the lumbar region, and the pelvic tilting was also very slight.

This is the only case I have seen at the completion of growth, after recumbency with extension has been carried out in child-

[4] Rapport adressé à Monsieur le Delégué du Gouvernement Provisoire sur les Traitements Orthopédiques de M. le Docteur Jules Guérin à l'Hôpital des Enfants pendant les Années 1843, 1844, et 1845, par une Commission composée de MM. Blandin, P. Dubois, Jobert, Louis, Rayer et Serres. Président, M. Orfila. Paris. 1848.

[5] *A Treatise on Congenital Dislocations of the Head of the Femur.* By Dr. John Murray Carnochan. New York: S. S. and W. Wood, 261, Pearl Street. 1850.

[6] *Traité des Luxations congénitales du Femur*, par le Docteur Pravaz. 1847.

hood for congenital displacement of the hip-joint, and the result must be regarded as extremely satisfactory, when we consider that without treatment the shortening would certainly have been not less than three inches, and it might have been four or five inches, which I have seen in several cases of unilateral displacement, the spinal curvature and tilting of the pelvis resulting in a proportionate degree. This case sufficiently proves the great advantages of the treatment I have recommended.

It is remarkable that for this valuable illustration we are indebted to an error of diagnosis, upon which the treatment was, as it were, accidentally carried out.

In my own cases, when undertaken at an early age, and the treatment extended over two or three years, the ultimate result cannot fail to be good; but some permanent defect—partly due to the malformation, and partly to the subsequent changes in the head and neck of the femur—must remain; and after the completion of growth, say at 20 years of age, there will probably be only about half an inch of shortening, or perhaps from that to one inch in some cases; but this result I should consider to be very satisfactory. Because absolute perfection is not to be reached, and a new hip-joint made, that is no reason why the consecutive deformities, which invariably result when these cases are left to Nature, should not be reduced to the minimum point, with a lifelong benefit to the patient.

On the Intermediate or Halfway Treatment.

I have frequently been asked whether anything could be done to diminish the resulting deformity in these cases when the whole treatment, according to the programme above laid down, either cannot be carried out, or is objected to by the parents, either from a fear of injury to the general health or some other cause. The answer is that although a halfway treatment can only end in a halfway result, still by adopting the following rules much may be done to diminish the consecutive deformity, either in a case of single or double displacement. When one hip-joint only is affected

1. Weight extension must be employed during the night, and part of the day, when the child is reclining on a sofa, say four to six hours, about two hours each time. The extension apparatus for this is simple enough, and such as is usually employed in cases of hip-joint disease.

2. The child may be allowed to walk about in the intervals of reclining, if old enough to use crutches, and then a raised boot of one inch and a half must be worn on the sound limb, the foot of the affected limb not being allowed to touch the ground. The affected limb will however swing backwards and forwards, and its own weight will to some extent act as an extending force. This can be carried out by the poorest class of patients.

Another method of locomotion, when a little expense is not objected to and more attention can be given, is by means of the splint or apparatus, which Mr Ernst has constructed for these cases, somewhat resembling the American hip-joint instrument, which combines extension with motion, and crutches are avoided, except perhaps to start with. The child usually gets along very well with one or two sticks. The raised boot is of course necessary on the sound limb when this apparatus is used, and an iron ring-patten on the foot of the affected limb, the boot being attached to the ring by straps, and the extension made by a rack-and-pinion movement in the side steel. The pelvic belt with pad placed above the great trochanter should also be used.

When both hip-joints are affected weight extension at night might be used; and recumbency with weight extension, during a portion of the day, say from four to six hours, taken partly in the morning and partly in the afternoon. Long standing and long sitting should be avoided, and the child should walk as little as possible in the earlier years of life. By these means the consecutive deformity will be diminished.

The Two Cases Referred to.

Case I.—*Congenital Displacement of Left Hip-joint treated by Recumbency, with Extension for Two Years and Seven Months.*—Tuesday, December 4th, 1885. Miss S., aged 2 years, was brought to me by Dr. G. Ransford.

Objective Symptoms.—She walked, leaning on one side, with a limping gait, dragging the left leg, with the foot everted. This leg appeared to be short and weak, but well-nourished. I first tested the muscular power in the various movements at the hip, knee, and ankle joints, which were all well performed, and I could find no trace of paralysis. Abduction at the hip-joint was somewhat limited by tension of the adductor longus. There was no pain in any movement at the hip-joint, nor any symptom of hip-joint disease.

Examination of Hip in the Standing Position.—When the child was standing undressed on the table, I placed a dot of ink exactly over the anterior superior spinous process, and then, drawing a line horizontally backwards from this point, it was at once evident that the top of the great trochanter was on a level with this line, and that the ilio-femoral triangle was obliterated. On the opposite side the base of the ilio-femoral triangle measured fully one inch —that is, the base of the triangle made between the horizontal line, from the anterior superior spinous process and a line drawn obliquely downwards from the same spot to the top of the great trochanter. In this little patient, a fat and well-nourished child, the top of the great trochanter on the healthy side was not so easily felt, but this can always be done when the child is standing on the table if the weight of the body is thrown upon the heel when the front part of the foot is uplifted, and then, the surgeon moving the foot inwards and outwards with one hand, the top of the trochanter can easily be felt with the other hand as a movement of horizontal rotation is communicated to it.

This examination conclusively proved that the head of the femur could not possibly be in the acetabulum if this cavity existed, and as there were none of the ordinary symptoms of dislocation, the only conclusion we could arrive at was that the head of the femur was displaced in consequence of an absence or malformation of the acetabulum.

Examination of the Hip when Lying Down.—When examined undressed on the table, the left leg appeared to be nearly one inch shorter than the right, but by a little extension the length was easily restored, and the head of the femur evidently moved up and down through the space of about an inch. With a thumb on the anterior superior spinous process, and a finger on the top of the great trochanter, the latter was felt to move up and down independently of the pelvis, and the base of the ilio-femoral triangle was easily restored.

This examination proved the deficiency of the acetabulum, and the diagnosis of the case was clearly established as one of displacement of the femur in consequence of congenital malformation of the acetabulum.

Dr. Ransford agreed with me in advising the parents that the

child should undergo the treatment of recumbency, with extension, which had proved so successful in the case published hy Dr. Buckminster Brown, of Boston, hut objections to the long confinement, with restraint, were at first raised.

History.—Dr. Ransford, who attended at the confinement, told me this was the first child, foot presentation; lahour not difficult; no turning or manipulative interference required; no peculiarity noticed at or immediately after the hirth. The child walked later than other children, and walked with a limp; when it began to walk, the left leg appeared to he weak, so that it seemed to drag, and the foot was everted.

Wednesday, February 3rd, 1886. Dr. Ransford and myself again met to examine Miss S., who had heen kept off her feet a great deal, and allowed to walk only for a short time, with a boot raised half or three-quarters of an inch. We found the hip in every respect the same as before. The parents now consented to the extension treatment heing carried out. The only modification in Dr. Brown's treatment which I felt desirous of making was with regard to the method of carrying out the extension. Dr. B. Brown's patient was confined to the bed, that is, outside the hed the whole time, and extension was made by weights and pulleys.

I wished to have a movahle extension plane, resting on a couch, when the patient was in the house, hut capahle of being carried ahout from one room to the other, and also of being placed in a spinal carriage, so that the child could be drawn into the open air every day, without any interruption to the extension. This of course presented many difficulties, but Mr. Ernst undertook it, and succeeded to perfection in constructing a movable extension plane and couch, which I have now used in six cases of congenital displacement and two cases of hip-joint disease requiring extension.

Instead of using the weights and pulleys Mr. Ernst employed the check-pulley—sometimes known as Durham's pulley—and the cords were fastened to brass standards fastened on the sides of the movahle plane.

On Tuesday, May 18th, 1886, Miss S. began the treatment regularly, having been on the plane for a fortnight only part of the day, and no difficulty was experienced in carrying it out. Dr. Ransford had the case closely under his observation, and I saw it occasionally.

On Wednesday, June 9th, 1886, we examined the little child, and the new apparatus seemed to he answering very well, and the child had already become accustomed to it.

On Wednesday, September 22nd, 1886, Dr. Ransford and myself examined Miss S. and some improvement had evidently taken place, as with the slight extension used the left leg nearly corresponded in length with the right, and the ilio-femoral triangle on the left side more nearly corresponded to that of the right leg.

Friday, October 29th, 1886. At this date there was risk of the treatment heing seriously interfered with, as I received a note from Dr. Ransford to say that Mrs. S. had taken her child to Hutton (the well-known bone setter) who said "the hip was dislocated, that he could reduce it five minutes, and at the end of two months the child would he perfectly well and walking." I advised that the highest surgical opinion should he taken independently of myself, and suggested Mr. T. Bryant, who I knew had paid much attention to these cases.

Friday, Novemher 5th, 1886. I received a note from Mr. Bryant to say that he had seen Miss S. in consultation with Dr. Ransford, and observed: "The diagnosis is clear, and the benefit derived from treatment is most encouraging. So much so indeed, that I

could not sanction the least deviation from the lines you have laid down."

As a result of this consultation the treatment was resumed, and on Tuesday, December 14th, 1886, I again saw the case with Dr. Ransford. We found that when the extension was removed the shortening of the left leg was scarcely half an inch, and very slight extension brought the left leg to the same length as the right, and restored the base of the ilio-femoral triangle. The parents seemed now to be satisfied that the treatment was likely to lead to a permanently good result. The child was drawn out in a spinal carriage once or twice a day, and the health was perfect.

On March 3rd, 1887, Dr. Ransford and myself examined Miss S. and found a steady improvement going on. No shortening of the left leg when slight extension is on, and very little when the extension is removed. The ilio-femoral triangle is nearly equal on both sides when extension is removed, and the head of the femur is evidently becoming more fixed in the improved position. It is nearly ten months since the commencement of the treatment on May 18th, 1886, and she will be 4 years old on the 23rd of this month.

Friday, June 3rd, 1887. I again examined Miss S. with Dr. Ransford, and we found the measurements and general condition the same as in the last report.

Friday, September 23rd, 1887. Dr. Ransford and myself examined Miss S. again and found all the improvement continues, with some little gain. Both legs the same length with very slight extension, and hardly any appreciable difference when extension is removed. The left ilio-femoral triangle nearly equal to the right. The movements at the hip-joint, tested gently, were all free. No disposition to spontaneous displacement.

Friday, December 23rd, 1887. I examined Miss S. again with Dr. Ransford, but there was no alteration to report. The measurements were the same, and the child in excellent health.

Friday, March 9th, 1888. Dr. Ransford and myself met again, and on the present occasion, at the request of the family, Dr. Wharton Hood, whose experience in joint affections has been very great, was added to the consultation. After carefully examining the left hip-joint, and comparing it with the opposite hip, and measuring the length of the legs, in which very little difference—only about an eighth of an inch—was perceptible, Dr. Hood expressed himself as much pleased with the result, and said that in any future case he should adopt the practice. The child's health has never been interfered with.

On Wednesday, May 23rd, 1888, I examined Miss S. with Dr. Ransford again, but there was nothing special to report.

Monday, November 19th, 1888, Dr. Ransford and myself examined Miss S. again, but found no change. The joint seems to be improved when a little movement is made, and no disposition to displacement.

Friday, December 7th, 1888. Dr. Ransford and myself agreed that Miss S. might now be allowed to begin to walk with a steel support to the left leg, in principle much resembling the American hip-joint instrument, but with some special arrangements which Mr. Ernst suggested, and for this he took the necessary measurements on this day. Mr. Ernst found the shortening of the left leg to be one-eighth of an inch, and also measuring the base of the ilio-femoral triangle, whilst I marked the spot, he found that on the left side to measure one inch and a quarter and on the right side one inch and three-eighths. Dr. Ransford and myself found the

head of the femur could not be displaced upwards by the moderate degree of force which it was only justifiable to try. When the great trochanter moved upwards the pelvis moved with it. Altogether the result seemed to be very satisfactory.

Thursday, December 20th, 1888. Miss S. began to walk to-day with the instrument Mr. Ernst had specially constructed for the case, and applied it himself. The nurse and mother quickly understood the details. Dr. Ransford assisted the little child in her first walk since the treatment was commenced, May 18th, 1886, just two years and seven months.

Wednesday, February 6th, 1889. Dr. Ransford and myself examined Miss S.. who has now become well accustomed to walking about with the instrument and using a pair of crutches. When examined undressed on the table we could not find that any change had taken place at the hip-joint, or in the length of the leg. She walks only for a short time in the morning and afternoon.

Friday, May 10th, 1889. I examined Miss S. again with Dr. Ransford, and we were unable to find that any change had taken place. She walks about more freely and with confidence, the hip-joint moving freely.

Case ii.—*Congenital Displacement of Right Hip-joint Treated by Recumbency with Extension for Two Years.*—Friday, October 1st, 1886. Miss D. W., aged 1 year, 9 months, was sent to me by Dr. Thomas May, Crayford, Kent.

Objective Symptoms.—She walks with a conspicuous limp, and drops the body to the right side. The right leg appears to be short and weak. The foot is everted in walking, but can be easily turned inwards. The movements of the hip-joint are quite free and painless; but abduction is a little limited, and in this movement the tendon of the adductor longus becomes rather prominent and tense. No trace of paralysis in any of the muscles, either above or below knee. No indication of incipient hip disease.

Examination of Hip in the Standing Position.—This gave the same results as in the previous case. The base of the ilio-femoral triangle on the right side was obliterated, and the top of the great trochanter was very nearly on a level with the anterior superior spinous process. On the healthy side the base of the ilio-femoral triangle was about one inch. The head of the right femur was evidently displaced in a direction upwards and backwards.

Examination of Hip when Lying Down.—This gave results very similar to the previous case. The right leg appeared to be about three quarters of an inch shorter than the left, when the inner malleoli of both legs were approximated. With the thighs flexed at a right angle with the body, the child still lying on its back, this shortening was at once seen to be above the knee-joint. With a little extension to the right leg, the base of the ilio-femoral triangle could be restored, and the top of the great trochanter could be seen and felt to move up and down, proving the deficiency of the acetabulum. This examination sufficiently established the diagnosis.

History.—This was a first child, and a breech presentation, but no turning was employed; it was proposed, but objected to, and the labour proceeded without any difficulty, the child being born breech first. No instruments were used. She walked later than other children, not until 1 year and 4 months old, and then with a limp, which gradually increased and became much worse within the last three months.

Treatment.—I strongly advised Dr. Buckminster Brown's treatment by long continued recumbency, with extension, but using

the improved plane, as in the previous case, so that the child could be drawn out daily in a spinal carriage.

On October 29th, 1886, this treatment was commenced, and no difficulty was experienced.

December 28th, 1886. I examined Miss W., and there seemed to be some improvement. With the slight extension on the plane, the shortening of the right leg was completely removed; but when the extension was released, the top of the great trochanter ascended again, but not so far as before treatment was commenced, hardly more than a quarter of an inch according to my note. The disposition to evert the foot was at first controlled by sandbags, and afterwards by a splint contrived by Mr. Ernst. This little child was constantly under the observation of Dr. Thomas May, and seen by myself at intervals of about two or three months. The mother was extremely attentive to all the details of treatment.

About the end of the first six months, on Tuesday, April 19th, 1887, Dr. May and myself carefully examined the child, with and without the extension, and the result appeared to be very satisfactory. When the extension was removed, the legs remained very nearly the same length, and the head of the femur was evidently becoming more fixed in the improved position; the great trochanter did not ascend spontaneously.

On Thursday, December 22nd, 1887, I made another careful examination with the same result and measurements as before. The general health remains very good. It is now a little over one year since the treatment was commenced.

On Thursday, May 10th, 1888, Dr. Thomas May and myself examined our little patient again carefully, only with the result of the same favourable reports as to the length of the legs, which were very nearly equal, and the head of the femur becoming more firmly fixed in the improved position. There had been noticed some little tendency to elevation of the heel, or rather, I should say inability to flex the foot beyond the right angle, no doubt caused by the foot being so long retained in a position with the toes pointing downwards during the extension, and for this I directed passive movement of the foot with the right hand, whilst some extension of the leg was being made with the left hand. There was nothing further to report.

On Wednesday, October 31st, 1888, as Miss W. has now completed her two years of recumbency with extension which she began on October 29th, 1886, it was arranged that she should begin to walk with a mechanical support, and for this purpose Mr. Ernst took careful measurements of the right leg, which he compared with the left. The legs were very nearly of equal length; not more than one eighth of an inch shortening on the right side could be measured. No inclination to spontaneous displacement, or any movement upwards, when a little manipulation to test this was applied. The ilio-femoral triangle was nearly equal on both sides, the right being about an eighth of an inch less. The joint movements are all free, and the muscular power very good. The general health is excellent, in no way injured by her complete recumbency, with extension, night and day for two years. During this time she has had a mild attack of measles, and also the whooping-cough, but the extension was not materially interfered with.

Monday, November 12th, 1888. Miss W. began to walk to-day with the instrument which Mr. Ernst has constructed for these cases, and I have described in the paper. Mr. Ernst applied it, and, with my assistance, the little girl walked about the room for

a short time. This was repeated every day, and she soon got accustomed to the use of her crutches.

Friday, February 1st, 1889. The little girl can now walk about alone, using crutches for half an hour in the morning, and the same in the afternoon. When left to herself on the couch, without the instrument, there is no disposition to displacement at the hip.

Friday, June 14th, 1889. Has walked without crutches sometimes, during the last three months, holding by the table and chairs, but I prefer the use of crutches or two sticks. She lies down on the extension couch two hours every day, and sleeps on it, the extension being used. All the measurements are the same, and there is no disposition to displacement.

Wednesday, August 7th, 1889. She now walks about more freely, but has been a little restrained lately.

After the last visit to me on June 14th, her mamma took her to the Zoological Gardens, and the fatigue and excitement were too much for her, and caused irritability, with some brain excitement in the evening, which has since recurred in the evening. The family having removed to Sevenoaks, Miss W. is now attended by Dr. Worship. The measurements of the leg and hip-joint remain the same, the difference not being more than an eighth of an inch.